Chapter 2: The Measurement and Structure of the National Economy

Cheng Chen

School of Economics and Finance
The University of Hong Kong

Chapter Outline

- National Income Accounting: The Measurement of Production, Income, and Expenditure
- Gross Domestic Product
- Saving and Wealth
- Real GDP, Price Indexes, and Inflation
- Interest Rates

National income accounting

- National income accounts: an accounting framework used in measuring current economic activity.
- Three alternative approaches give the same measurements:
  - *Product approach*: the amount of output produced.
  - *Income approach*: the incomes generated by production.
  - *Expenditure approach*: the amount of spending by purchasers.
- Juice business example (In Chapter 2.1).

Why are the three approaches equivalent?

- They must be, by definition: Any output produced (product approach) is purchased by someone (expenditure approach) and results in income to someone (income approach).
- The fundamental identity of national income accounting:

$$\text{total production} = \text{total income} = \text{total expenditure}. \tag{1}$$

Gross domestic product

- The product approach to measuring GDP:
- Market value: allows adding together unlike items by valuing them at their market prices.
- Newly produced: counts only things produced in the given period; excludes things produced earlier.

Gross domestic product (Cont.)

- Final goods and services:
  - Don't count intermediate goods and services.
  - Final goods
  - Capital goods
  - Inventory investment
  - Adding up value added works well.

GNP vs. GDP

- GNP (gross national product) = output produced by domestically owned factors of production.
- GDP = output produced within a nation:

$$GDP = GNP - NFP \tag{2}$$

where NFP=net factor payments from abroad= payments to domestically owned factors located abroad minus payments to foreign factors located domestically.

- Example:.
- Difference between GNP and GDP is small for the U.S., about 0.2%, but higher for countries that have many citizens working abroad.

GNP/GDP in Hong Kong

The expenditure approach to measuring GDP

- Measures total spending on final goods and services produced within a nation during a specified period of time.
- Four main categories of spending: consumption (C), investment (I), government purchases of goods and services (G), and net exports (NX). The income-expenditure identity:

$$Y = C + I + G + NX.$$

Consumption

- Consumption: spending by domestic households on final goods and services (including those produced abroad). About 2/3 of U.S. GDP.
- Three categories:
  - Consumer durables (examples: cars, TV sets, furniture, major appliances).
  - Nondurable goods (examples: food, clothing, fuel).
  - Services (examples: education, health care, financial services, transportation).

Investment

- Investment: spending for new capital goods (fixed investment) plus inventory investment. About 1/6 of U.S. GDP
- Three categories:
  - Business (or nonresidential) fixed investment.
  - Residential fixed investment.
  - Inventory investment.

Government purchases

- Government purchases of goods and services: spending by the government on goods or services. About 1/5 of U.S. GDP.
- Most by state and local governments, not federal government.
- Not all government expenditures are purchases of goods and services.
- Some government spending is for capital goods that add to the nation's capital stock, such as highways, airports, bridges, and water and sewer systems.

Net exports: exports minus imports

- Exports: goods produced in the country that are purchased by foreigners.
- Imports: goods produced abroad that are purchased by residents in the country.
- Imports are subtracted from GDP, as they represent goods produced abroad, and were included in consumption, investment, and government purchases.

Table 2.1 Expenditure Approach to Measuring GDP in the United States, 2011

	Billions of dollars	Percent of GDP
Personal consumption expenditures (C)	**10729**	**71.2**
Consumer durables	1146	7.6
Nondurable goods	2478	16.4
Services	7104	47.1
Gross private domestic investment (I)	**1855**	**12.3**
Business fixed investment	1480	9.8
Nonresidential structures	405	2.7
Equipment and software	1075	7.1
Residential investment	339	2.2
Inventory investment	37	0.2
Government purchases of goods and services (G)	**3060**	**20.3**
Federal	1222	8.1
National defense	821	5.4
Nondefense	401	2.7
State and local	1838	12.2
Net exports (NX)	**−568**	**−3.8**
Exports	2094	13.9
Imports	2662	17.7
Total (equals GDP) (Y)	**15076**	**100.0**

Note: Numbers may not add to totals shown owing to rounding.
Source: Bureau of Economic Analysis Web site, *www.bea.gov*, Table 1.1.5, July 27, 2012

The income approach to measuring GDP

- Adds up income generated by production (including profits and taxes paid to the government).
- National income = compensation of employees (including benefits) + proprietors' income + rental income of persons + ...
- National income + statistical discrepancy = net national product.
- Net national product + depreciation (the value of capital that wears out in the period) = gross national product (GNP).
- GNP – net factor payments (NFP) = GDP.

Private sector and government sector income

- Private disposable income = income of the private sector = private sector income earned at home (Y or GDP) and abroad (NFP) + ...
- Government's net income:

$$T - TR - INT. \tag{3}$$

- Private disposable income + government's net income:

$$GDP + NFP = GNP. \tag{4}$$

Table 2.2 Income Approach to Measuring GDP in the United States, 2011

	Billions of dollars	Percent of GDP
Compensation of employees	8295	55.0
Proprietors' income	1157	7.7
Rental income of persons	410	2.7
Corporate profits	1827	12.1
Net interest	527	3.5
Taxes on production and imports	1036	6.9
Business current transfer payments	133	0.9
Current surplus of government enterprises	–27	–0.2
Total (equals **National Income**)	**13,359**	**88.6**
Plus Statistical discrepancy	32	0.2
Equals **Net National Product** (NNP)	**13,391**	**88.8**
Plus Consumption of fixed capital	1937	12.8
Equals **Gross National Product** (GNP)	**15,328**	**101.7**
Less Factor income received from rest of world	784	5.2
Plus Payments of factor income to rest of world	532	3.5
Equals **Gross Domestic Product** (GDP)	**15,076**	**100.0**

Note: Numbers may not add to totals shown owing to rounding.
Source: Bureau of Economic Analysis Web site, *www.bea.gov*, Tables 1.7.5 and 1.12, July 27, 2012

Wealth

- Household wealth = a household's assets minus its liabilities.
- National wealth = sum of all households', firms', and governments' wealth within the nation.
- Saving by individuals, businesses, and government determine wealth.

Measures of aggregate saving

- Saving = current income − current spending.
- Saving rate = saving/current income.
- Private saving = private disposable income − consumption:

$$S_{pvt} = (Y + NFP - T + TR + INT) - C. \tag{5}$$

- Government saving = net government income − government purchases of goods and services:

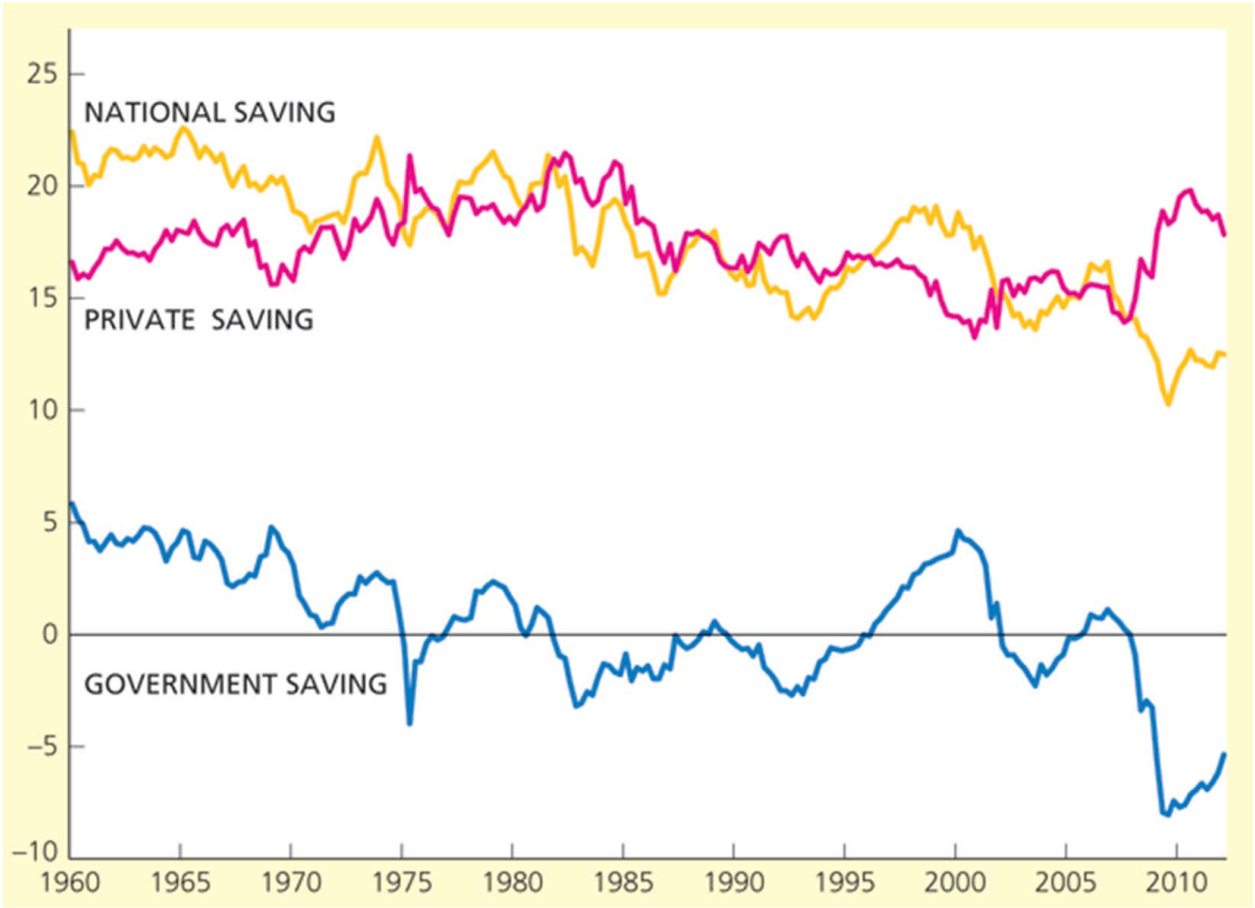
Measures of aggregate saving (Cont.)

- Government saving = government budget surplus = government receipts – government outlays:
  - Government receipts = tax revenue (T).
  - Government outlays = ...
  - Government budget deficit = $-$ S_{govt}.
- Simplification: count government investment as government purchases, not investment.

National saving

- National saving = private saving + government saving:
- Figure 2.1 plots national saving, private saving, and government saving relative to GDP.

Figure 2.1 U.S. saving measures as a percentage of GDP, 1960–2012



The uses of private saving

- The uses-of-saving identity—saving is used in three ways: (1) investment (I); (2) government budget deficit ($-S_{govt}$); and (3) current account balance (CA)

$$\begin{aligned} S &= I + (NX + NFP) \\ &= I + CA, \end{aligned} \tag{6}$$

  where $CA = NX + NFP$ is current account balance.
- Since $S = S_{pvt} + S_{govt}$, we have...

Relating saving and wealth

- Stocks and flows:
  - Flow variables: measured per unit of time (GDP, income, saving, investment).
  - Stock variables: measured at a point in time (quantity of money, value of houses, capital stock).
  - Flow variables often equal rates of change of stock variables.
- Wealth and saving as stock and flow (wealth is a stock, saving is a flow).

National wealth

- National wealth: domestic physical assets + net foreign assets.
  - Country's domestic physical assets (capital goods and land).
  - Country's net foreign assets.
  - Wealth matters because the economic well-being of a country depends on it.
- Changes in national wealth
  - Change in value of existing assets and liabilities.
  - National saving ($S = I + CA$) raises wealth.
- Comparison of U.S. saving and investment with other countries

Summary 1 Measures of the Aggregate Savings

Measures of Aggregate Saving

Saving measure	Definition and formula
Private saving	Private disposable income less consumption $S_{pvt} = (Y + NFP - T + TR + INT) - C$
Government saving	Government receipts less government outlays $S_{govt} = (T - TR - INT) - G$
National saving	Private saving plus government saving; also GNP ($Y + NFP$) less consumption and government purchases $S = S_{pvt} + S_{govt} = Y + NFP - C - G$

Real GDP

- Nominal variables are those in dollar terms.
- Problem: Do changes in nominal values reflect changes in prices or quantities?
- Real variables: adjust for price changes; reflect only quantity changes.
- Nominal GDP is the dollar value of an economy's final output measured at current market prices.
- Real GDP is an estimate of the value of an economy's final output, adjusting for changes in the overall price level.

Table 2.3 Production and Price Data

	Year 1	Year 2	Percent change from year 1 to year 2
Product (quantity)			
Computers	5	10	+100%
Bicycles	200	250	+25%
Price			
Computers	$1200/computer	$600/computer	−50%
Bicycles	$200/bicycle	$240/bicycle	+20%
Value			
Computers	$6000	$6000	0
Bicycles	$40,000	$60,000	+50%
Total	**$46,000**	**$66,000**	**+43.5%**

Table 2.4 Calculation of Real Output with Alternative Base Years

Calculation of real output with base year = Year 1					
	Current quantities		Base-year prices		
Year 1					
Computers	5	×	$1200	=	$6000
Bicycles	200	×	$200	=	$40,000
				Total =	**$46,000**
Year 2					
Computers	10	×	$1200	=	$12,000
Bicycles	250	×	$200	=	$50,000
				Total =	**$62,000**
Percentage growth of real GDP = ($62,000 − $46,000)/$46,000 = **34.8%**					

Calculation of real output with base year = Year 2					
	Current quantities		Base-year prices		
Year 1					
Computers	5	×	$600	=	$3000
Bicycles	200	×	$240	=	$48,000
				Total =	**$51,000**
Year 2					
Computers	10	×	$600	=	$6000
Bicycles	250	×	$240	=	$60,000
				Total =	**$66,000**
Percentage growth of real GDP = ($66,000 − $51,000)/$51,000 = **29.4%**					

Price Indexes

- A price index measures the average level of prices for some specified set of goods and services, relative to the prices in a specified base year.
- GDP deflator $= 100 \times$ nominal GDP/real GDP. Note that base year $P = 100$.
- Consumer Price Index (CPI)

Price Indexes

- A price index measures the average level of prices for some specified set of goods and services, relative to the prices in a specified base year.
- GDP deflator $= 100 \times$ nominal GDP/real GDP. Note that base year $P = 100$.
- Consumer Price Index (CPI)
- The computer revolution and chain-weighted GDP

Inflation

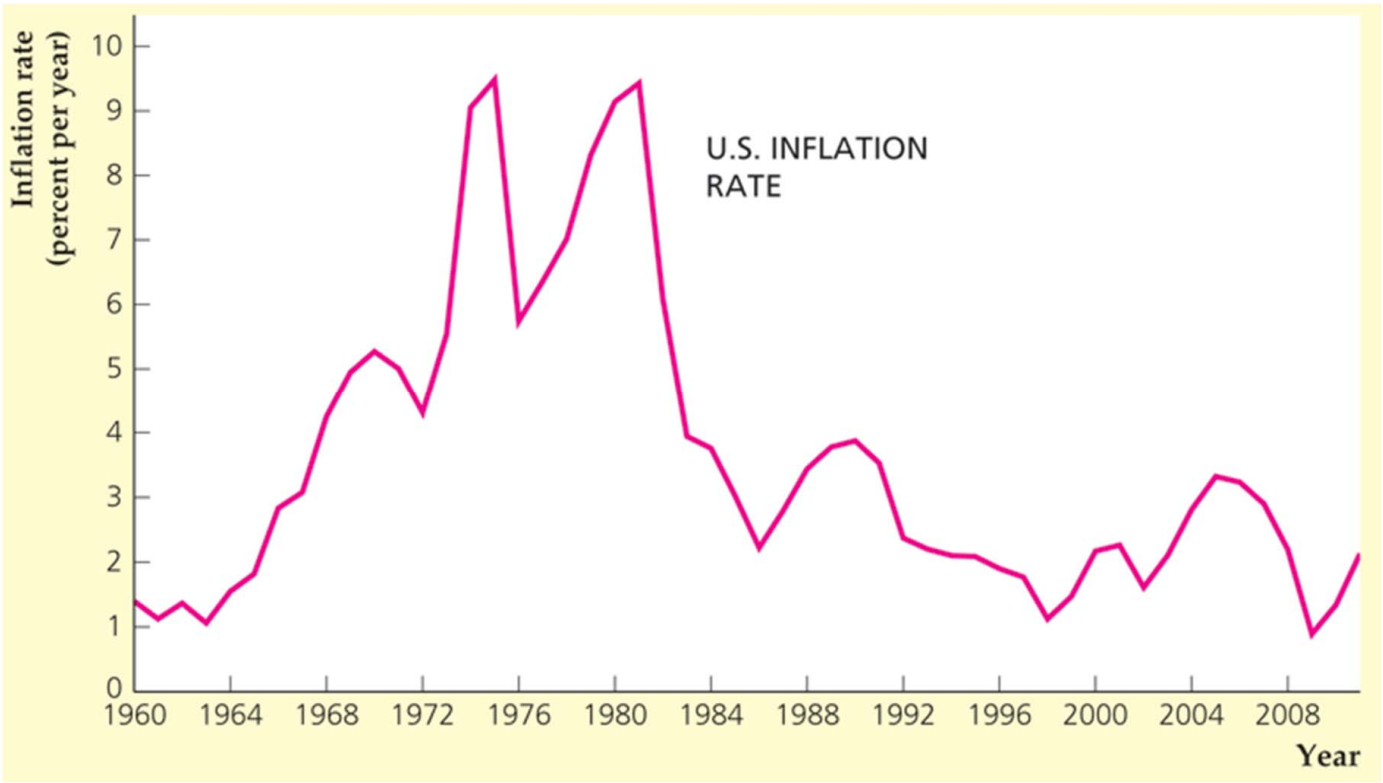
- Calculate the inflation rate:

$$\pi_{t+1} = \frac{P_{t+1} - P_t}{P_t} = \frac{\Delta P_{t+1}}{P_t}. \tag{7}$$

  Fig. 2.2 shows the U.S. inflation rate since 1960 for the GDP deflator.

- Does CPI inflation overstate increases in the cost of living?
  - The Boskin Commission reported that the CPI was biased upwards.
  - Price indexes with fixed sets of goods don't reflect substitution by consumers when one good becomes relatively cheaper than another (i.e., the substitution bias).
  - If inflation is overstated, then real incomes are higher than we thought and we've overindexed payments like Social Security.

Figure 2.2 The Inflation Rate in the United States, 1960-2011



Source: Implicit price deflator for GDP, from FRED database, Federal Reserve Bank of St. Louis, *research.stlouisfed.org/fred2/series/GDPCTPI.*

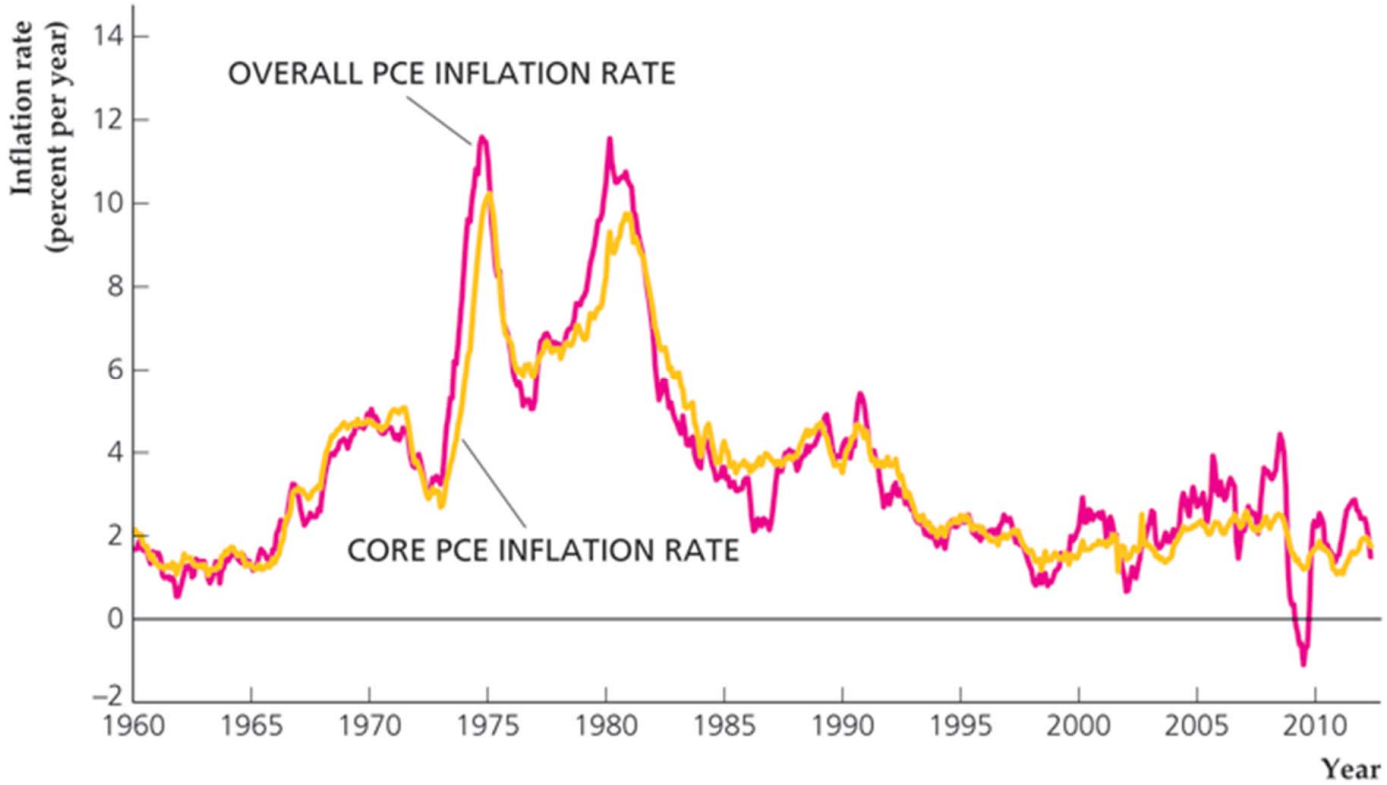
Application: The Fed's preferred inflation measures

- The Federal Reserve focuses its attention on the personal consumption expenditures (PCE) price index.
- The Fed forecasts both the overall PCE price index and the core PCE price index.

Application: The Fed's preferred inflation measures

- The Federal Reserve focuses its attention on the personal consumption expenditures (PCE) price index.
- The Fed forecasts both the overall PCE price index and the core PCE price index.
- The Fed uses the core PCE price index to measure the underlying trend in inflation.

Figure 2.3 Overall PCE inflation rate and core PCE inflation rate, 1960-2011



Source: Federal Reserve Bank of St. Louis FRED database at *research.stlouisfed.org/fred2/series/PCEPI and PCEPILFE.*

Interesting Video to Watch

- Hyperinflation in Hell
- Website: `https://www.youtube.com/watch?v=TsdSxk-qxZE`

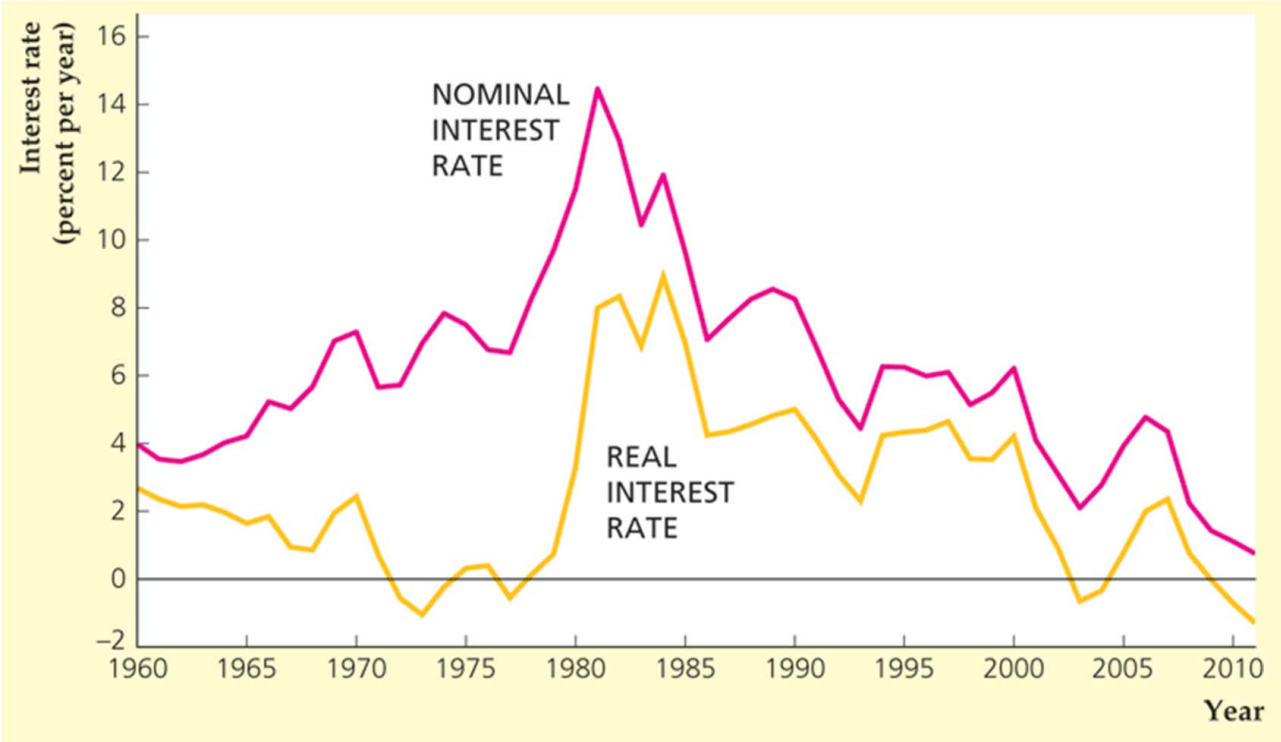
Real vs. nominal interest rates

- Interest rate: a rate of return promised by a borrower to a lender.
- Real interest rate.
- Nominal interest rate.
- Real interest rate $= i - \pi$. Fig. 2.4 plots nominal and real interest rates for the U.S. since 1960.
- The expected real interest rate:

$$r = i - \pi^e \tag{8}$$

If $\pi = \pi^e$, real interest rate = expected real interest rate.

Figure 2.4 Nominal and real interest rates in the United States, 1960-2011



Source: The implicit price Deflator for GDP is the same as for Fig. 2.2. Inflation rates for 2012 and 2013 are assumed to be 2%. The nominal interest rate on three-year Treasury securities is from the Board of Governors of the Federal Reserve System, Statistical Release H15, *www.federalReserve.gov/releases.*

Comparison

- Mainland China: compared with the U.S.,
  - Household consumption;
  - Investment;
  - Government purchases,
  - Net exports.

Comparison

- Mainland China: compared with the U.S.,
  - Household consumption;
  - Investment;
  - Government purchases,
  - Net exports.
- HK: compared with the U.S.,
  - Household consumption;
  - Investment;
  - Government purchases,
  - Net exports.

Short Essay

- Questions:
  - Is economic structure of mainland China different from the U.S.? Consumption level? Level of investment? Exports and imports?
  - Why? (corruption, social safety net, housing market, inventory change and made in China)
  - Is economic structure of HK different from the U.S.? Government purchases? Exports and Imports?
  - Why? (size of government and dependence on international trade)

Short Essay

- Questions:
  - Is economic structure of mainland China different from the U.S.? Consumption level? Level of investment? Exports and imports?
  - Why? (corruption, social safety net, housing market, inventory change and made in China)
  - Is economic structure of HK different from the U.S.? Government purchases? Exports and Imports?
  - Why? (size of government and dependence on international trade)
- How to write an essay?
  - Para. one: State your argument and present data (you can use my tables as well).
  - Para. two: Why are there such differences between mainland China (or HK) and the U.S. (collect data by yourself and use it)?

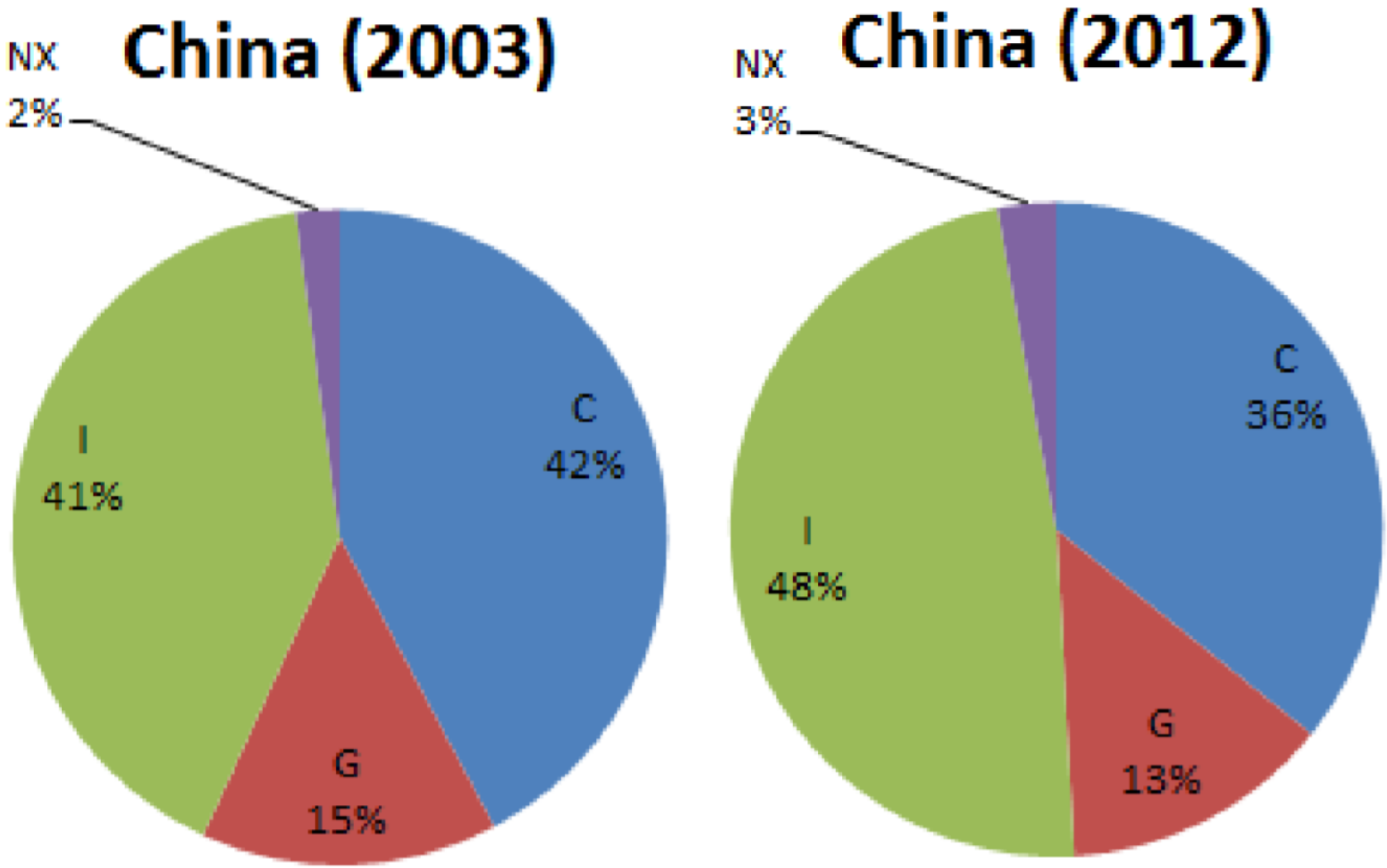
Composition of China's GDP

Counti	Year	Item	Value
China,	2012	Final consumption expenditure	4.11258E+12
China,	2012	Household consumption expenditure (including Non-profit institu	2.99276E+12
China,	2012	General government final consumption expenditure	1.11982E+12
China,	2012	Gross capital formation	4.01626E+12
China,	2012	Gross fixed capital formation (including Acquisitions less disposal	3.85198E+12
China,	2012	Changes in inventories	1.64282E+11
China,	2012	Exports of goods and services	2.31277E+12
China,	2012	Imports of goods and services	2.07007E+12
China,	2012	Gross Domestic Product (GDP)	8.3584E+12
China,	2003	Final consumption expenditure	9.38567E+11
China,	2003	Household consumption expenditure (including Non-profit institu	6.96503E+11
China,	2003	General government final consumption expenditure	2.42064E+11
China,	2003	Gross capital formation	6.76124E+11
China,	2003	Gross fixed capital formation (including Acquisitions less disposal	6.46254E+11
China,	2003	Changes in inventories	29869385622
China,	2003	Exports of goods and services	4.85027E+11
China,	2003	Imports of goods and services	4.49206E+11
China,	2003	Gross Domestic Product (GDP)	1.65051E+12
China,	1996	Final consumption expenditure	5.28248E+11
China,	1996	Household consumption expenditure (including Non-profit institu	4.0841E+11
China,	1996	General government final consumption expenditure	1.19839E+11
China,	1996	Gross capital formation	3.46215E+11
China,	1996	Gross fixed capital formation (including Acquisitions less disposal	2.89242E+11
China,	1996	Changes in inventories	56972579961
China,	1996	Exports of goods and services	1.71666E+11
China,	1996	Imports of goods and services	1.46661E+11
China,	1996	Gross Domestic Product (GDP)	8.92014E+11

Composition of Hong Kong's GDP

Country or Area	Year	Item	Value
China: Hong Kong SA	2012	Final consumption expenditure	1.92E+11
China: Hong Kong SA	2012	Household consumption expenditure (including Non-prof	1.68E+11
China: Hong Kong SA	2012	General government final consumption expenditure	2.39E+10
China: Hong Kong SA	2012	Gross capital formation	6.85E+10
China: Hong Kong SA	2012	Gross fixed capital formation (including Acquisitions less d	6.95E+10
China: Hong Kong SA	2012	Changes in inventories	-1E+09
China: Hong Kong SA	2012	Exports of goods and services	5.92E+11
China: Hong Kong SA	2012	Imports of goods and services	5.88E+11
China: Hong Kong SA	2012	Gross Domestic Product (GDP)	2.63E+11
China: Hong Kong SA	2003	Final consumption expenditure	1.11E+11
China: Hong Kong SA	2003	Household consumption expenditure (including Non-prof	9.28E+10
China: Hong Kong SA	2003	General government final consumption expenditure	1.77E+10
China: Hong Kong SA	2003	Gross capital formation	3.61E+10
China: Hong Kong SA	2003	Gross fixed capital formation (including Acquisitions less d	3.49E+10
China: Hong Kong SA	2003	Changes in inventories	1.17E+09
China: Hong Kong SA	2003	Exports of goods and services	2.71E+11
China: Hong Kong SA	2003	Imports of goods and services	2.57E+11
China: Hong Kong SA	2003	Gross Domestic Product (GDP)	1.61E+11

Graphic Representation of China's GDP



Graphic Representation of Hong Kong's GDP